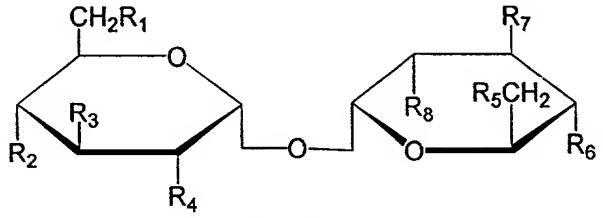
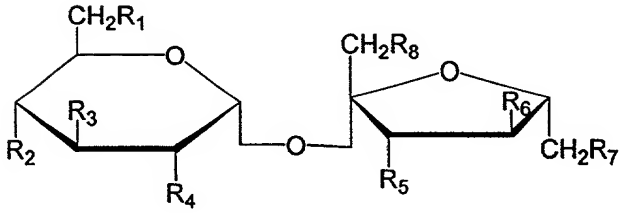
CLAIMS

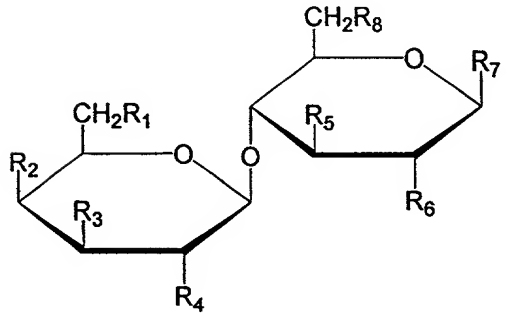
1. A substituted carbohydrate having the structure defined by a Formula selected from the group consisting of



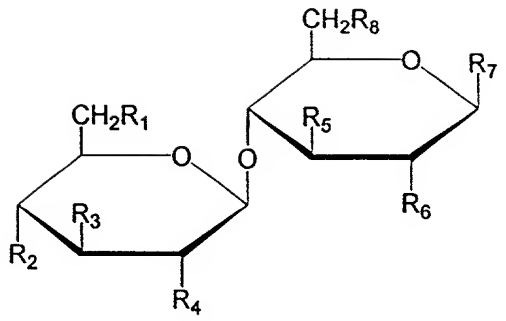
Formula 1;



Formula 2;



Formula 3; and



Formula 4;

wherein, in each of Formula 1-4:

one or more of R_{1-8} are independently NHR_9, $N(R_9)_2$, $O(C=O)R_9$, or OR_9, wherein R_9 is a branched, saturated or unsaturated, C3-C8 hydrocarbon; and

the remainder of R_{1-8} are independently H, NHR_{10}, $N(R_{10})_2$, $O(C=O)R_{10}$, or OR_{10}, wherein R_{10} is a C1-C4 straight chain alkyl group.

2. The substituted carbohydrate according to claim 1

wherein one or more of R_{1-8} are independently $O(C=O)R_9$, and $O(C=O)R_9$ is the acid acyl group of an acid selected from the group consisting of isobutyrate, pivalate, 2,2-dimethylbutyrate, 3,3-dimethylbutyrate, and 2-ethyl butyrate;

wherein the remainder of R_{1-8} are independently $O(C=O)R_{10}$; and

wherein R_{10} is selected from the group consisting of methyl, ethyl, propyl and butyl.

3. A substituted carbohydrate selected from the group consisting of trehalose hexa-3,3-dimethylbutyrate, trehalose diacetate-hexa-3,3-dimethylbutyrate, trehalose octa-3,3-dimethylbutyrate, lactose isobutyrate-heptaacetate, lactose 3-acetyl-hepta-3,3-dimethylbutyrate and lactose octa-3,3-dimethylbutyrate.

4. A composition comprising a substituted carbohydrate according to claim 1, 2, or 3, and a substance capable of being released from the composition.

5. The composition according to claim 4, wherein the substituted carbohydrate is in the form of a solid matrix having the substance incorporated therein.

6. The composition according to claim 5, further comprising at least one physiologically acceptable glass selected from the group consisting of carboxylate, nitrate, sulfate, bisulfate, a hydrophobic carbohydrate derivative, and combinations thereof.

7. The composition according to claim 5, wherein the composition is in the form of a solid delivery system selected from the group consisting of lozenge, tablet, disc, film, suppository, needle, microneedle, microfiber, particle, microparticle, sphere, microsphere, powder, and an implantable device.

8. The composition according to claim 5, wherein the substance is a pharmaceutically active chemical.

9. The composition according to claim 8, wherein the substance is selected from the group consisting of lipids, proteins, peptides, peptide mimetics, hormones, saccharides, nucleic acids, and protein nucleic acid hybrids.

10. The composition according to claim 9, wherein the proteins are selected from the group consisting of enzymes, growth hormones, growth factors, insulin, monoclonal antibodies, interferons, interleukins and cytokines.

11. The composition according to claim 5, wherein the substance is immunogenic and is selected from the group consisting of live viruses, attenuated viruses, nucleotide vectors encoding antigens, bacteria, antigens, antigens plus adjuvants and haptens coupled to carriers.

12. A method of making a solid delivery system, the method comprising processing a substituted carbohydrate according to claim 1, 2, or 3, and a substance to be released therefrom, thereby to form a solid matrix having the substance incorporated therein.

13. A method of making a solid delivery system, the method comprising:

a) forming or obtaining a substituted carbohydrate according to claim 1, 2, or 3, which is capable of forming a vitreous glass; and

b) processing the substituted carbohydrate and a substance to be released therefrom, thereby to form a solid matrix having the substance incorporated therein.

14. The method according to claim 12 wherein the processing step comprises:

i) melting the substituted carbohydrate;

ii) incorporating the substance in the melt, wherein the melt temperature is sufficient to fluidize the substituted carbohydrate, and insufficient to substantially inactivate the substance; and

iii) quenching the melt.

15. The method according to claim 12 wherein the processing step comprises:

i) dissolving or suspending the substituted carbohydrate and the substance in a solvent effective in dissolving at least one of the substituted carbohydrate and the substance; and

ii) evaporating the solvent.

16. The method according to claim 13 wherein the forming comprises reacting free hydroxyl groups on a carbohydrate with at least one acid acyl group including a branched hydrocarbon chain thereon, thereby to form the substituted carbohydrate.

17. The method according to claim 12 wherein the method further comprises incorporating into the matrix at least one physiologically acceptable glass-forming material selected from the group consisting of carboxylate, nitrate, sulfate, bisulfate, a hydrophobic carbohydrate derivative and combinations thereof.

18. The method according to claim 12 wherein the method further comprises processing the matrix into a form selected from the group consisting of lozenge, tablet, disc, film, suppository, needle, microneedle, microfiber, particle, microparticle, sphere, microsphere, powder, and an implantable device.

19. The method according to claim 18 wherein the substance is a pharmaceutically active chemical.

20. The method according to claim 19 wherein the substance is selected from the group consisting of lipids, proteins, peptides, peptide mimetics, hormones, saccharides, nucleic acids, and protein nucleic acid hybrids.